An Essay
on the
Development
of the
Human Organism,
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An Essay on the Development of the Human Organism.

In the investigation of organised bodies we recognise certain Physiological laws. Starting with a single point, we observe the various changes as they develop themselves until we have an organism complete.

Whether our attention be directed to the lowest order in the vegetable kingdom or the highest order in the animal economy, there is no difference in the primordial structure or starting point; each has its

origin from a solitary point, which is the same in every essential, we might say in every identical particular. And according as extraneous forces are brought to bear, we have an organism perfect in development, harmonious in structure and wonderful in its powers of action; or we have an organism imperfect in structure and incomplete in its development.

It seems to be the great law of nature to make for herself an ideal model or archetype; and according as the passage toward this ideal model is more or less perfectly accomplished, form after form in varied succession, arises; no matter what may may be the class of animals on

plants. These data or starting points, Physiologists have denominated cells. There are two methods mentioned in which cells originate; either in an organizable fluid, under the influence of a living solid figure with which it is in contact; or in the interior of previously formed cells. Both these methods are said to be observed in the Animal as well as the Vegetable organism. It has, also, been remarked that gum holds the same rank or relation in the economy of Plants that albumen does in that of the Animal; and the glutinous compounds which exist in the elaborated Sap, and which is specially

abundant in parts where organisation is taking place with rapidity, may be compared with fibrine. This glutinous sap undergoes a sort of coagulation when withdrawn from the vessels, and may sometimes be perceived to resolve itself into distinct organic granules. Single, larger, and more shapely defined granules are next to be seen, and these soon present a regular form and increase in size, apparently from the coagulation of the minuter granules around the larger ones. These bodies usually assume a flattened disc-like form, with a circular, or oval outline; and they soon become subservient to the formation of cells, and are called cell-germs. From the sur-

face of each of these a delicate transparent membrane is seen to project or encircle it; this is called the commencement of the cell or cell-wall.

This membrane gradually projects more and more and extends beyond the cell-germ, or cytoblast as it is more commonly called, which is at last seen, as a mere spot upon its walls. When the cell is complete, the granular cytoblast commonly disappears; sometimes, however, it remains in the wall of the cell, where it has long been known under the name of nucleus.

It had been supposed that the cytoblast, or rather the granules of which it is composed are the germs

of new cells, afterwards to be developed within the parent vesicle; and that even when it disappears, it is by a resolution into its component parts or granules, which may act as well separately as in aggregation.

Having traced the formation of cells thus far in the first form, not very minutely, but sufficient we hope to answer our purpose, we come to the consideration of the second mode in which cells are developed. This development or formation of cells takes place within the primordial or previously formed cell; the granules which they contain being, apparently, the germs from which they originate. The secondary cells developed within a parent vesicle,

originating in the granular germs which it includes, at first grows at the expense of the fluid it contains, and afterwards by absorbing nutrient material through its walls. When they have undergone great increase in size, they distend the original vesicle in such a manner that its limits are no longer apparent. Now in place of one solitary cell we have several; each perfect in itself and containing all the elements of the original cell, viz. nucleus, nucleolus and cell-wall. The nucleolus is a small pellucid spot which is frequently seen in the centre of the nucleus, sometimes two or three nucleoli may be seen in a single nucleus. The cause of their appearance

does not appear to be fully understood; but it seems to be of a transitory character, indicating a certain stage in the conversion of the nucleus into new cells. The form of cells is variable; depending chiefly upon the degree and direction of the pressure to which they may have been subjected at the period of their origin and subsequently to it. Sometimes they are spheroidal; sometimes cubical or prismatic; sometimes cylindrical; and sometimes very much prolonged. These cells undergo various transformations. One of the most common is the conversion of several into a continuous tube or canal.

These cells when fully evolved

in their turn produce others in their interiors; and in this manner a complex and extensive organism may be developed from a single cell-germ.

Having thus followed the cause of the cell through their origin and development we come now to consider the origin and development of the human organism.

We have said that it was the great law of nature to reach an ideal model or archetype. Where do we find this great law fulfilled and nature's mighty archetype brought to perfection but in man?

Ever contending against opposing forces, the struggle on many=

like, to accomplish her task and rear the mighty archetype. Now when she has accomplished her design and brought to maturity the object of her affection, and it begins more rapidly to die, does she forsake her much loved and long cherished progeny; but ever watchful to the best interests of her idol offspring, she brings every resource to her aid to maintain its equilibrium and oppose the nimina inimica; but in spite of all her efforts to save her idol, she sees indelible decay written on its countenance, and inevitable death stamped on every feature. When, then, all her powers have failed, and there is no more for

her to accomplish. She delivers up to the God of Nature her long cherished idol to be resolved again into its original elements, a part to be returned to the dust from which it came and a part to be made perfect in the "great hereafter". These changes are ever going on in the course of nature. To day we see the new born infant, helpless and dependent in its mothers arms; to day the mature man glorying in the might of his strength and the power of his intellect; and to day we see the aged man, helpless in his second infancy, sinking away into the arms of a waiting Immortality.

We see this great problem of

nature being worked out every day; and what wonder that that ancient Philosopher should thereby be "The greatest Study of man is man?"

Had we the time and ability to follow out these changes minutely, we should make ourself tedious by the length of our Thesis. We will content ourself therefore, interesting as the Subject is, by observing some of the more prominent characteristics in the formation of the embryo; noticing the nutrition and growth of the foetus, and more particularly foetal circulation; the changes which take place at birth; the peculiarities of childhood and youth; and finally man in his

maturity and decline.

Starting with a solitary cell, as we stated at the outset, all organized bodies take their origin; man is not an exception to this law, he too, may date his origin from a single cell. This cell is termed the germ-cell, and is contained within the ovum of the female; this coming in contact with the Sperm-cell of the male, becomes fertilized.

The first change which takes place in it is the disappearance of its granular vesicle, and germinal Spot. The yolk is next observed to contract so as to leave a clear Space between it and the

Zona pellucida - a membrane which surrounds the yolk. -

As the passage along the tube is taking place the Zona assumes a coating of albuminous material, which is what is called in birds the white of the egg. It eventually becomes the chorion - a thin membrane which surrounds the foetus in utero on every side, and appears to be developed from nucleated cells formed in the Fallopian tubes. -

After the disappearance of the germinal vesicle, a new cell, the embryonic cell, arises and this undergoes subdivision, an effect in which the yolk soon becomes

involved, each new cell so a-
rising assumes a part of the
yolk. A constant proces of bi-
section is thus established, each
division containing a nucleated
cell. At this period may be
seen the Spermatozoa involved
in the Zona pellucida, and as
the proces of bisection goes on
the mass assumes a mulberry as-
pect, and finally becomes gran-
ular. This cell-formation hav-
ing been accomplished at the
surface of the yolk, first, the
cells there begin to coalesce into
a membrane; and as the change
passes toward the centre the cells
as they form, come toward the mem-

brane and thicken it leaving a clear liquid within. In this manner a secondary vesicle forms within the Zona pellucid. Its walls constitute the germinal membrane upon which the embryo arises. New cells being constantly added the membrane becomes thickened; here the yolk is to be considered as presenting two portions- the germ-yolk and the food-yolk- the former is immediately employed in the development of the embryo, and the latter being a stock for a more advanced supply. In mammals, for which other means of nutrition are quickly supplied the food-yolk is im-

perceptable and, moreover, in them the albuminous coating of the Zona pellucida is small.

After the passage through the Fallopian tubes the embryo is nourished in a special but temporary manner by the villous coat of the chorion, which absorbes fluid exuding from the uterine decidua very much after the manner of the Spongioles of a plant, but almost immediately the necessity arises of diverting more directly the albuminoid material to the quickly-growing embryo from the yolk-bag, to which it would have gone, and this distention implies new chanels of transport, which, under

the form of a vascular apparatus, are now provided. A proper vascular apparatus for the combined purpose of nutrition, secretion, and respiration; it is the placenta. Its origin is in the little blood-tubes which form in the tufts of the chorion, in man at one point, in ruminants at several, giving rise, in the former case, to one organ, in the latter to several, or to one of composite structure, the cotyledons.

The foetal vessels thus arising in the villi of the chorion become intermingled with vessels coëmporaneously rising from the uterus; and, though in some cases, this intermingling is less complicated, so that

maternal and foetal portions are separable, in man the interlacing is complete, the principle being to bring the foetal vascular tufts in such a relation with the maternal blood-sinuses by the tufts dipping down or being enveloped therein, that the completest contact and facility of exchange, but not of intermixture, may be insured.

Every foetus had a deciduous layer upon it, and the blood brought by the curling arteries of the uterus furnishes to the foetus its oxygen, and receives back carbonic acid and other excrementitious matters. In this respect respiration is carried on by the aid of a mechanism which an-

lowers to the gills of fishes, the ma=
ternal arterial blood standing for the
aerated water; but besides this
the villi have another office to
perform- the absorption of albumin=
ous material from the maternal
blood- In the mean time blood
vessels become visible and other ru=
dimentary vessels and organs begin
to be formed through the embryonic
mass. Ossification begins to take
place at different points; the em=
bryo or foetus increases in size and
consistency, by the multiplication
of new cells, each set arranging them=
selves according to the organs which
they are intended to form, and each
organ, in turn, being developed in

its appropriate form and place must we have a foetus complete.

The heart first appears as a simple tube or canal, arising in the vascular layer from a columnar mass of cells, of which the inner ones have delignated to form a tube. This soon seems to be doubled upon itself, and to become trichambered, containing an auricle a ventricle and the bulbus arteriosus. Subsequently the auricle and ventricle are each divided by a septa. The division of the auricle does not take place till after the ventricle, and even then it is not complete, an aperture, the foramen ovale existing.

Of the five brachial arches, two

disappear; the aortic bulb then divides into two, which are to be the aorta and pulmonary artery respectively. Next, one of the branchial arches forms the subclavian and carotid arteries. Of the middle pair the right is obliterated, but the left remains to constitute the arch of the aorta. Of the lowest pair the right forms the right and left pulmonary arteries, and the left constitutes the ductus arteriosus.

After the blood system has become fully developed, the circulation is described as follows.

The umbilical cord conveys oxidized blood from the placenta, a

part passing into the ascending vena cava through the ductus venosa, and the rest passing into the liver by the vena portae, from which it reaches the vena cava through the hepatic vein. It then passes into the right auricle, and, to some extent is kept from intermingling with the venous blood coming through the descending vena cava, by means of the Eustachian valve, which directs the arterial blood through the foramen ovale into the left auricle, from whence it gains the left ventricle, and also directs the venous blood of the descending cava into the right ventricle. The blood which is in the left ventricle is

driven therefrom into the ascending aorta, and supplies the head; but the venous blood which is in the right ventricle is driven therefrom through the pulmonary artery and ductus arteriosus into the descending aorta and mingles with the arterial blood therein and and passes to the trunk and lower extremities. Of this blood a portion is carried to the placenta to be arterialized.

When the foetus becomes fully developed, and had arrived at its full uterine maturity, there is a process established or an action set up in the uterus to expel the foetus from its cavity. This con-

finishes what is called labor or parturition. When this is accomplished, that which was the foetus in utero, is now the infant in its mother's arms. At the moment of birth a change takes place in the circulation, and natural respiration is established.

The venous blood is collected from all parts of the system and conveyed to the right auricle of the heart through the vena cava, from thence it passes through the tricuspid orifice into the right ventricle; from thence it is driven to the lungs through the pulmonary artery to be aerated, after which it is collected by the pulmonary veins and conveyed into the left

auricle, from thence it passes into the left ventricle through the mitral orifice; from thence it is driven through the aorta to all parts of the body.

At birth the human infant is the perfect representative of weakness and imbecility. It appears to be totally unconscious of every thing around, though it opens its eyes at once it exhibits no token of visual perception; though it may be subjected to sounds and noises of various kinds, it takes no notice whatever of them.

We have seen the foetus supported under three varieties of nutrition, yolk, fluid, and placental

nutrition. Two other modes of nutrition are now to be mentioned; Lactation, and, after the dental mechanism is supplied, the diet of mature life. Lactation is essentially different from placental nutrition except in the manner in which it is taken into the system and introduced into the circulation; in each instance the nutrition is derived from the mother.

The object of nutrition is to repair the waste of the system and maintain its equilibrium. It does this by furnishing material for the production and growth of new cells, and heat to the animal economy.

We are told that at every

respiration, and at every motion of the body and limbs; and at every act of the mind, the tissues of the system must suffer, and that some portions of them are broken down and destroyed."

In childhood and youth the system is in almost constant activity, consequently there is a greater demand for nutrient material to build up new tissues and repair the waste of system than in more advanced life. We have this demand abundantly supplied; the circulation is more active and the blood contains more of the life-giving and life-sustaining material. As long as this nutrient material is

supplied in abundance, or in a greater quantity than is necessary to repair the waste of the system, the child continues to increase in size and strength.

At puberty, a condition of both sexes, which obtains about the fourteenth year in the male and a little younger in the female, the human organism undergoes a very marked change, mentally, morally, and physically. The male, at this period assumes a more manly dignity, his mind expands and he conceives of ideas entirely new and interesting to him; and according as his mind is educated his moral condition will be elevated

or depressed, and his influence will be felt and appreciated, in after life, by his fellow men.

When the physical system has reached its ultimatum, the character may be said to be fully formed, perhaps at an earlier period. The mind continues to expand, and to be developed, gathering strength day by day, and does not reach its greatest capacity until a later period. When the mental and physical systems have become fully developed there is no limits to the power and will of man. There is no danger too great for him to dare; no hazard too reckless for him to run; and no enemy too strong for him to conquer.

At this period the female undergoes as great a change. She now lays aside her girlish sports and toys and assumes other occupations and amusements. She is coy and reserved when in the presence of the other sex; "the blush of modesty overspreads her countenance"; her body and limbs are moulded into that beautifully symmetrical form so characteristic of her sex; her mind is active and her moral sentiments are wonderfully acute. She is naturally timid; but where her affections are enlisted no danger is able to deter her from the defense of the object of her affection. The mind of man is ever active; though his physical system has

grown weak and inactive, his mind continues, but not so vividly and clearly. To lay up treasures in the great Store-house of knowledg. Whatever of knowledg is once gained is never lost, although it may not always be at command, it is still retained; and when the strength had failed and the eye become dim; when the ear had become dull of hearing, and the hoary locks tell that the sands of life have nearly run, the old man wonders as some scene of his youth, long since forgotten, is revived again in his mind, and he believes the words of his ecclesiastical adviser, who tells him that, "every idea expressed and every word breathed in life shall be whispered back to him in Eternity"